Claims:

1. A method for the quantification of the earth's subsurface area heat flow and its error bounds by stochastic analysis comprising devising a stochastic heat conduction equation based on random thermal conductivity, an exponentially decreasing heat source and associated boundary conditions and arriving at a stochastic solution to the temperature field obtained using a series expansion method, and obtaining the expression for mean heat flow and variance in heat flow.
2. A method as claimed in claim 1 wherein the boundary conditions are surface temperature and surface heat flow.
3. A method as claimed in claim 1 wherein the stochastic heat conduction equation is of the formula

$$\frac{d}{dz}\left(K(z)\frac{dT}{dz}\right) = -A(z)$$

4. A method as claimed in claim 1 wherein the stochastic heat conduction equation is solved using a series expansion method to obtain the closed form solution to the mean and variance in the heat flow fields, and using thermal conductivity of the subsurface layer of the earth's crust as a random parameter.
5. A method as claimed in claim 1 wherein the expression for heat flow is obtained and the expressions for the mean and variance in heat flow derived by taking expectation and using the property of the random field.
6. Method for the evaluation of the thermal state for related oil and natural gas applications and also in tectonic studies and in studies related to the crystallization of minerals comprising quantifying the earth's subsurface area heat flow and its error bounds by stochastic analysis comprising devising a stochastic heat conduction equation based on random thermal conductivity, an exponentially decreasing heat source and associated boundary conditions and arriving at a stochastic solution to the temperature field obtained using a series expansion method, and obtaining the expression for mean heat flow and variance in heat flow.
7. A method as claimed in claim 6 wherein the boundary conditions are surface temperature and surface heat flow.
8. A method as claimed in claim 6 wherein the stochastic heat conduction equation is of the formula

$$\frac{d}{dz}\left(K(z)\frac{dT}{dz}\right) = -A(z)$$

9. A method as claimed in claim 6 wherein the stochastic heat conduction equation is solved using a series expansion method to obtain the closed form solution to the mean and variance in the heat flow fields, and using thermal conductivity of the subsurface layer of the earth's crust as a random parameter.

10. A method as claimed in claim 6 wherein the expression for heat flow is obtained and the expressions for the mean and variance in heat flow derived by taking expectation and using the property of the random field..